

Fig. 3 shows that if we combine the precipitation for June and July, as has been done in this chart, we have a curve of rainfall that follows the curve of yield even more closely than the July rainfall alone, as might be expected, particularly in 1891 and 1896. It will be noticed that the lowest yield occurred in 1901, when the rainfall for June and July was 2.50 inches below the normal, whereas the next lowest yield was in 1894, when the rainfall for June and July was 3.25 inches below the normal. A study of individual States shows that the yield in 1894 was particularly low only in the Western States, while it was but slightly below the normal in the Eastern States. The meteorological records show a severe drought during both summers, but in 1894 it extended later into August, while in 1901 it began somewhat earlier in June. Higher temperatures accompanied the drought in 1901, intensifying its influence and helping to force the yield lower than in 1894.

We are of the opinion that a more detailed study of the yield of corn by counties, and the distribution of the rainfall, both geographically and daily, will show an even closer relation between the yield of corn and the rainfall for a comparatively short period during the summer.

We believe also that a more complete study of this whole subject will show that there are comparatively short periods during the growth of practically every crop when favorable weather will insure a large crop and unfavorable weather will cause a small crop.

### INVARIABILITY OF OUR WINTER CLIMATE.

By WM. B. STOCKMAN, District Forecaster, in charge of Division of Meteorological Records, dated June 24, 1904.

In order to comply with the request of a correspondent asking whether the winters are becoming less rigorous than formerly, it was recently necessary to compile temperature data covering a considerable period of years at a number of selected stations, so distributed as to show the general conditions obtaining over the country generally east of the Mississippi Valley. In this section only could records of the necessary length be obtained.

TABLE 1.

Station.	Average of 50 winters, 1854-55 to 1903-4.	Mean of first 25 winters, 1854-55 to 1879-80.	Departure from average of 50 winters.	Mean of second 25 winters, 1879-80 to 1903-4.	Departure from average of 50 winters.
Fort Snelling, Minn.	13.4	12.9	-0.5	13.8	+0.4
Fort Leavenworth, Kans.	29.3	29.1	-0.2	29.6	+0.3
New Orleans, La.	55.4	55.2	-0.2	55.5	+0.1
St. Louis, Mo.	33.5	33.5	0.0	33.5	0.0
Chicago, Ill.	25.2	25.0	-0.2	25.5	+0.3
Cincinnati, Ohio.	34.4	34.8	+0.4	34.0	-0.4
Cleveland, Ohio.	28.2	28.2	0.0	28.2	0.0
New Bedford, Mass.	29.3	29.1	-0.2	29.5	+0.2
Washington, D. C.	34.5	34.2	-0.3	34.9	+0.4
Charleston, S. C.	51.2	51.1	-0.1	51.3	+0.1

I believe these data and tables will be of interest to our officials and perhaps of value in enabling them to readily answer the various questions bearing on that subject so often asked by newspaper men and others.

TABLE 2.—Mean monthly and winter temperatures.

Year.	Fort Snelling, Minn.					Fort Leavenworth, Kans.					New Orleans, La.					St. Louis, Mo.					Chicago, Ill.					Year.
	Dec.	Jan.	Feb.	Mean	Dept.	Dec.	Jan.	Feb.	Mean	Dept.	Dec.	Jan.	Feb.	Mean	Dept.	Dec.	Jan.	Feb.	Mean	Dept.	Dec.	Jan.	Feb.	Mean	Dept.	
1854-55.	20.6	17.1	12.6	16.8	+ 3.4	34.4	28.1	38.2	33.6	+ 4.3	52.4	55.1	50.3	52.6	-2.8	35.6	32.1	28.0	31.9	-1.6	28.0	26.0	18.0	24.0	- 1.2	1854-55
1855-56.	9.5	6.1	11.7	9.1	- 4.3	23.4	10.1	24.6	19.4	- 9.9	55.1	43.0	54.8	51.0	- 4.4	30.7	18.4	25.0	24.7	- 8.8	22.0	13.0	17.0	17.3	- 7.9	1855-56
1856-57.	8.8	-2.5	16.4	7.6	- 5.8	22.5	12.1	33.2	22.6	- 6.7	54.2	51.6	66.3	57.4	+2.0	29.3	19.0	41.6	30.0	- 3.5	18.4	10.7	30.6	19.9	- 5.3	1856-57
1857-58.	25.4	18.0	7.6	17.0	+ 3.6	39.2	40.1	25.6	35.0	+ 5.7	58.5	60.4	56.5	58.5	+3.1	40.2	40.2	27.0	35.8	+2.3	31.4	33.0	19.0	27.8	+ 2.6	1857-58
1858-59.	12.0	7.8	14.2	11.3	- 2.1	31.9	32.6	32.5	32.3	+ 3.0	62.0	53.9	63.7	59.9	+4.5	38.0	33.1	37.2	36.1	+2.6	28.0	27.0	29.0	28.0	+ 2.8	1858-59
1859-60.	0.5	9.8	14.2	8.2	- 5.2	18.9	29.6	35.2	27.9	- 1.4	53.2	55.1	59.6	56.0	+0.6	34.2	32.7	36.8	34.6	+1.1	15.7	18.1	26.8	20.2	- 5.0	1859-60
1860-61.	10.0	7.7	15.5	11.1	- 2.3	26.2	22.7	33.7	27.5	- 1.8	55.4	54.0	62.2	57.2	+1.8	31.3	32.4	40.4	34.7	+1.2	20.5	21.9	29.4	23.9	- 1.3	1860-61
1861-62.	15.9	2.1	1.9	6.6	- 6.8	35.4	20.2	24.1	26.6	- 2.7	.....	.....	.....	.....	.....	39.6	29.7	30.2	33.2	- 0.3	28.4	18.2	26.9	22.5	- 2.7	1861-62
1862-63.	17.4	14.4	11.7	14.5	+ 1.1	41.0	34.9	29.7	35.2	+ 5.9	.....	.....	.....	.....	.....	41.2	37.4	35.6	38.1	+4.6	30.3	33.5	20.6	28.1	+ 2.9	1862-63
1863-64.	17.9	11.4	20.0	16.4	+ 3.0	23.8	25.0	34.3	29.4	+ 0.1	.....	.....	.....	.....	.....	35.7	29.1	37.8	34.2	+0.7	26.3	16.2	23.6	22.0	- 3.2	1863-64
1864-65.	6.4	9.7	19.1	11.7	- 1.7	20.2	25.4	34.3	26.6	- 2.7	.....	.....	.....	.....	.....	30.0	28.4	37.8	32.1	- 1.4	17.8	17.2	26.0	20.3	- 4.9	1864-65
1865-66.	7.1	8.2	5.9	7.1	- 6.3	22.6	26.3	29.0	26.0	- 3.3	.....	.....	.....	.....	.....	31.2	32.6	33.2	22.3	- 1.2	20.2	17.7	17.9	18.6	- 6.6	1865-66
1866-67.	10.0	13.2	18.0	13.7	+ 0.3	28.1	21.0	32.3	27.1	- 2.2	.....	.....	.....	.....	.....	33.7	25.9	39.7	33.1	- 0.4	25.8	19.9	30.8	25.5	+ 0.3	1866-67
1867-68.	16.1	4.2	13.9	11.4	- 2.0	34.6	19.6	32.2	28.8	- 0.5	.....	.....	.....	.....	.....	35.7	25.8	34.7	32.1	- 1.4	28.8	17.9	24.7	23.8	- 1.4	1867-68
1868-69.	15.5	18.2	19.4	17.7	+ 4.3	26.4	33.8	32.9	31.0	+ 1.7	.....	.....	.....	.....	.....	28.9	38.7	37.1	34.9	+1.4	22.6	31.2	29.3	27.7	+ 2.5	1868-69
1869-70.	19.5	12.6	17.0	16.4	+ 3.0	26.4	29.1	35.1	30.2	+ 0.9	49.0	54.6	54.8	52.8	- 2.6	33.1	33.6	36.1	34.3	+0.8	28.6	25.9	27.5	27.3	+ 2.1	1869-70
1870-71.	19.6	13.1	20.2	17.6	+ 4.2	28.6	30.4	38.2	32.4	+ 3.1	47.8	53.6	60.5	54.0	- 1.4	31.0	37.7	39.9	36.2	+2.7	27.1	30.9	30.2	29.4	+ 4.2	1870-71
1871-72.	7.7	13.8	18.4	13.3	- 0.1	24.1	24.7	30.9	26.6	- 2.7	55.5	48.1	55.3	53.0	- 2.4	30.2	28.3	32.2	30.2	- 3.3	20.0	23.0	25.5	22.8	- 2.4	1871-72
1872-73.	3.9	4.4	11.0	6.4	- 7.0	21.0	18.7	29.7	23.1	- 6.2	51.1	49.3	60.3	53.6	- 1.8	25.3	25.7	33.6	28.2	- 5.3	19.0	20.4	24.1	21.2	- 4.0	1872-73
1873-74.	17.2	12.2	13.0	14.1	+ 0.7	31.5	28.5	28.9	29.6	+ 0.3	56.6	55.8	58.9	57.1	+1.7	37.1	35.2	36.1	36.1	+2.6	32.0	28.9	31.4	30.8	+ 5.6	1873-74
1874-75.	17.7	- 4.4	- 2.1	3.7	- 9.7	32.6	15.1	20.5	22.7	- 6.6	58.6	54.3	55.8	56.2	+0.8	37.5	23.9	26.0	29.1	- 4.4	33.5	17.9	14.7	22.0	- 3.2	1874-75
1875-76.	25.4	17.1	11.7	18.1	+ 4.7	39.9	35.9	38.3	38.0	+ 8.7	61.6	60.3	59.0	60.3	+4.9	43.4	41.5	40.8	41.9	+8.4	36.8	33.0	31.8	33.9	+ 8.7	1875-76
1876-77.	6.6	6.9	30.8	14.8	+ 1.4	23.3	23.9	39.5	28.9	- 0.4	47.9	53.5	55.6	52.3	- 3.1	24.9	31.3	41.5	32.6	- 0.9	20.0	21.9	36.4	26.1	+ 0.9	1876-77
1877-78.	31.5	20.1	30.7	27.4	+14.0	44.1	33.9	40.0	39.3	+10.0	55.6	50.9	55.4	54.0	- 1.4	49.9	35.8	41.1	41.6	+8.1	42.8	31.2	35.7	36.6	+11.4	1877-78
1878-79.	15.4	11.6	8.2	11.7	- 1.7	23.2	23.6	32.8	26.5	- 2.8	50.8	53.1	55.8	53.2	- 2.2	27.1	28.3	33.9	29.8	- 3.7	23.7	21.4	27.4	24.2	- 1.0	1878-79
1879-80.	8.0	22.4	19.4	16.6	+ 3.2	26.4	41.4	37.9	35.2	+ 5.9	59.5	63.0	60.4	61.0	+5.6	32.3	45.7	39.2	39.1	+5.6	30.3	40.1	34.6	35.0	+ 9.8	1879-80
1880-81.	10.4	5.0	4.2	6.5	- 6.9	25.6	20.5	25.1	23.7	- 5.6	52.9	50.3	56.0	53.1	- 2.3	27.1	21.7	30.3	26.4	- 7.1	23.0	19.5	24.7	22.4	- 2.8	1880-81
1881-82.	26.6	15.3	26.3	22.7	+ 9.3	40.2	32.4	42.0	38.2	+ 8.9	59.2	62.4	62.5	61.4	+6.0	40.8	32.1	43.9	38.9	+5.4	37.1	28.3	38.2	34.5	+ 9.3	1881-82
1882-83.	11.6	- 2.8	8.9	5.9	- 7.5	31.6	19.4	27.9	26.3	- 3.0	54.0	53.8	62.9	57.9	+2.5	32.3	23.2	31.3	28.9	- 4.6	20.0	16.3	23.0	19.8	- 5.4	1882-83
1883-84.	15.8	3.7	8.0	9.2	- 4.2	35.1	21.1	27.9	28.0	- 1.3	60.3	47.1	60.7	56.0	+0.6	39.5	25.8	35.5	33.6	+0.1	30.1	19.2	27.7	25.7	+ 0.5	1883-84
1884-85.	8.9	- 0.8	4.6	4.2	- 9.2	24.1	19.0	21.6	21.6	- 7.7	58.7	52.1	53.1	54.6	- 0.8	32.8	26.0	27.0	28.6	- 4.9	28.4	18.3	16.1	20.9	- 4.3	1884-85
1885-86.	21.3	3.5	14.5	13.1	- 0.3	32.8	14.4	30.2	25.8	- 3.5	53.1	45.5	53.2	50.6	- 1.8	38.9	24.8	35.1	32.9	- 0.6	31.1	21.4	28.1	26.9	+ 1.7	1885-86
1886-87.	7.3	- 1.1	8.4	4.9	- 8.5	23.7	20.7	28.9	24.4	- 4.9	51.6	51.4	65.2	56.1	+0.7	29.8	30.8	40.6	33.7	+0.2	25.0	17.3	27.1	23.1	- 2.1	1886-87
1887-88.	16.1	- 2.3	10.5	8.1	- 5.3	27.2	16.3	31.4	25.0	- 4.3	52.9	55.6	58.6	55.7	+0.3	31.5	24.3	32.2	29.3	- 4.2	28.1	15.1	23.0	22.1	- 3.1	1887-88
1888-89.	25.4	18.3	5.9	16.5	+ 3.1	35.8	29.8	27.5	31.0	+ 1.7	53.8	53.4	53.4	53.5	- 1.9	38.2	34.8	31.4	34.8	+1.3	32.2	29.0	19.9	27.0	+ 1.8	1888-89
1889-90.	29.1	10.9	19.9	20.0	+ 6.6	45.3	28.1	32.3	35.2	+ 5.9	64.3	53.1	64.0	64.5	+9.1	49.8	39.2	40.2	43.1	+9.6	40.6	30.8	32.4	34.6	+ 9.4	1889-90
1890-91.	21.7	19.6	8.7	16.7	+ 3.3	37.0	33.2	29.8	33.3	+ 4.0	56.4	53.2	62.6	57.4	+2.0	47.6	36.6	35.9	36.7	+3.2	30.6	30.2	28.6	29.8	+ 4.6	1890-91
1891-92.	29.4	10.8	23.0	21.1	+ 7.7	39.3	23.9	36.4	33.2	+ 3.9	55.9	49.3	60.6	55.3	- 0.1	42.8	25.9	40.0	36.2	+2.7	35.4	19.5	30.2	28.4	+ 3.2	1891-92
1892-93.	14.8	3.2	9.1	9.0	- 4.4	26.0	21.8	26.6	24.8	- 4.5	55.8	50.2	61.2	55.7	+0.3	33.0	24.8	30.8	29.5	- 1.0	23.4	12.0	21.5	19.0	- 6.2	1892-93
1893-94.	12.4	10.2	14.2	12.3	- 1.1	35.4	29.6	27.2	30.7	+ 1.4	58.4	58.0	54.9	57.1	+1.7	36.4	35.5	32.4	34.8	+1.3	25.4	27.5	23.0	25.3	+ 0.1	1893-94
1894-95.	27.0	6.0	10.7	14.6	+ 1.2	37.8	24.0	24.9	28.9	- 0.4	57.8	53.2	62.2	55.0	- 3.7	38.8	26.2	25.1	30.0	- 3.5	32.4	17.6	17.0	22.3	- 2.9	1894-95
1895-96.	21.1	15.6	20.8	19.2	+ 5.8	32.6	31.4	35.8	33.3	+ 4.0	53.8	52.2	56.2	54.1	- 1											
1896-97.	23.3	9.4	18.6	17.1	+ 3.7	40.4	27.4	32.9	33.6	+ 4.3	54.8	51.1	58.0	54.6	- 0.8	40.8	30.6	36.8	36.3	+2.8	32.9	27.8	28.6	27.8	+ 2.6	1896-97
1897-98.	15.4	22.6	20.8	19.6	+ 6.2	28.0	32.4	35.4	31.9	+ 2.6	57.0	58.6	56.6	57.4	+2.0	32.8	37.3	38.4	36.2	+2.7	25.5	28.6	27.6	27.1	+ 1.9	1897-98
1898-99.	13.3	13.7	7.6	11.5	- 1.9	27.4	30.9	19.4	25.9	- 3.4	50.8	53.2	49.4	51.1	- 1.3	32.6	32.6	24.1	29.8	- 3.7	24.3	20.0	17.9	21.7	- 3.5	1898-99
1899-00.	21.2	21.1	8.4	16.9	+ 3.5	30.2	34.6	25.2	30.0	+ 0.7	54.6	52.2	53.4	53.4	- 2.0	33.0	37.4	29.8	33.4	- 0.1	27.2	28.7	20.1	25.3	+ 0.1	1899-00
1900-01.	21.7	16.2	12.6	16.8	+ 3.4	35.8	34.7	26.7	32.4	+ 1.1	55.6	55.6	53.4	54.9	- 0.5	38.0	37.2	31.0	35.4	+1.9	30.0	26.0	17.0	24.3	+ 0.9	1900-01
1901-02.	15.8	18.5	17.8	17.4	+ 4.0	28.4	30.8	23.4	27.5	+ 1.8	52.0	53.4	50.2	51.9	- 3.5	30.2	34.2	26.4	29.7	- 3.8	24.0	25.2	20.8	23.3	+ 1.9	1901-02
1902-03.	15.9	15.0	15.0	15.3	+ 1.9	29.0	31.6	28.5	29.7	+ 0.4	54.0	51.0	56.4	54.1	- 1.3	34.0	33.7	33.6	33.8	+0.3	26.5	24.0	25.0	25.0	- 0.0	1902-03
1903-04.	12.9	7.6	6.2	8.9	- 4.5	31.9																				

The stations selected were Fort Snelling, Minn.; Fort Leavenworth, Kans.; New Orleans, La.; St. Louis, Mo.; Chicago, Ill.; Cincinnati and Cleveland, Ohio; New Bedford, Mass.; Washington, D. C., and Charleston, S. C.

The data for Fort Snelling and Fort Leavenworth are not as satisfactory as could be desired, for to fill breaks in the continuity of these records it was found necessary to use the figures from contiguous stations having the required data, which in the case of Fort Snelling were Fort Ripley, Minn., from January, 1858, to December, 1865, inclusive, and St. Paul, Minn., from December, 1892, to February, 1904, inclusive; and for Fort Leavenworth, Kans., Leavenworth City, Kans., from December, 1871, to February, 1893, inclusive, and Kansas City, Mo., from December, 1893, to February, 1904, inclusive.

From January, 1860, to December, 1861, inclusive, the values for Washington, D. C., are those of Georgetown (west Washington). No data were found for the winters of 1861-62 to 1868-69, inclusive, at New Orleans, La.; nor for 1854-55 at Cleveland, Ohio. The data for Forts Snelling and Ripley, Minn., were taken from U. S. Army post hospital records, and St. Paul, Minn., from Weather Bureau records; Fort Leavenworth, Kans., from post hospital, and Leavenworth, Kans., and Kansas City, Mo., from Weather Bureau records; New Bedford, Mass., from voluntary records throughout the series. The figures for the remaining stations were obtained from the records of voluntary observers cooperating with the Smithsonian Institution until the beginning of Weather Bureau data November 1, 1870, at New Orleans, La., Cincinnati and

Cleveland, Ohio, and Washington, D. C.; January, 1871, at St. Louis, Mo., and Charleston, S. C.; and December, 1871, at Chicago, Ill.

The kind of exposure given Weather Bureau thermometers is set forth in Table 4. The character of exposure of thermometers used by U. S. Army post surgeons, and by voluntary observers is not known, but it is assumed to be in the open and a few feet above sod.

As overlapping data from voluntary and Weather Bureau observers were not available for the majority of stations, it was not deemed advisable to attempt to reduce and harmonize the data from the several observers to a standard for each station.

Table 3 gives all the overlapping data from the stations considered on file at the Central Office.

The means of the winter months, December, January, and February, were added together and divided by three to establish a mean for each winter, and the average of the winters for the 50-year period, 1854-55 to 1903-4, inclusive, determined. Each winter was then compared with the 50-year average and the departure ascertained.

From a study of the departures given during the last past fifty years it will be seen that the contention that the winters of recent years are less rigorous than those of former years, at least so far as temperature is concerned, is not well founded, for at Cleveland, Ohio, and St. Louis, Mo., the mean of the first and second 25-year periods was the same as the 50-year average; at Cincinnati the second period averaged 0.8° lower than

TABLE 2.—Mean monthly and winter temperatures.—Continued.

Year.	Cincinnati, Ohio.					Cleveland, Ohio.					New Bedford, Mass.					Washington, D. C.					Charleston, S. C.					Year.
	Dec.	Jan.	Feb.	Mean	Dept.	Dec.	Jan.	Feb.	Mean	Dept.	Dec.	Jan.	Feb.	Mean	Dept.	Dec.	Jan.	Feb.	Mean	Dept.	Dec.	Jan.	Feb.	Mean	Dept.	
1854-55.	34.6	34.9	29.0	32.8	-1.6	.....	.....	.....	.....	.....	28.3	32.0	23.5	27.9	-1.4	32.4	34.8	26.8	31.3	-3.2	48.3	51.1	47.0	48.8	-2.4	1854-55
1855-56.	35.0	20.8	26.7	27.5	-6.9	29.6	15.2	18.4	21.1	-7.1	34.2	20.9	22.6	25.9	-3.4	36.8	21.3	26.8	28.3	-6.2	53.2	39.4	47.6	46.7	-4.5	1855-56
1856-57.	29.7	21.2	45.4	32.1	-2.3	24.5	14.5	37.4	25.5	-2.7	27.6	18.6	33.1	26.4	-2.9	31.5	21.5	41.8	31.6	-2.9	49.1	41.7	58.4	49.7	-1.5	1856-57
1857-58.	39.7	40.8	29.1	36.5	+2.1	36.1	35.4	22.5	31.3	+3.1	36.0	34.1	25.0	31.7	+2.4	34.8	39.8	30.8	35.1	+0.6	57.7	55.8	47.9	53.8	+2.6	1857-58
1858-59.	44.9	36.1	40.6	40.5	+6.1	34.9	29.3	31.2	31.8	+3.6	32.5	29.0	31.6	31.0	+1.7	39.6	36.0	39.2	38.3	+3.8	57.8	50.8	55.7	54.8	+3.6	1858-59
1859-60.	28.6	36.2	36.8	33.9	-0.5	25.2	28.0	29.4	27.5	-0.7	29.3	30.5	28.3	29.4	+0.1	33.5	35.1	35.4	34.7	+0.2	52.9	51.7	55.2	53.3	+2.1	1859-60
1860-61.	32.1	34.2	40.8	35.7	+1.3	27.3	27.2	34.4	29.6	+1.4	29.7	26.6	33.8	30.0	+0.7	34.3	33.7	36.3	34.8	+0.3	47.3	51.3	54.9	51.2	0.0	1860-61
1861-62.	40.4	35.2	34.6	36.7	+2.3	36.9	27.5	27.2	30.5	+2.3	33.6	29.0	28.2	30.3	+1.0	41.5	35.0	35.8	37.4	+2.9	51.9	53.3	54.6	53.3	+2.1	1861-62
1862-63.	40.0	38.4	38.6	39.0	+4.6	35.5	31.8	29.1	32.1	+3.9	32.7	36.4	31.2	33.4	+4.1	36.3	37.2	35.2	36.2	+1.7	48.0	51.2	57.3	52.2	+1.0	1862-63
1863-64.	38.6	30.4	36.0	35.0	+0.6	34.8	27.6	31.0	31.1	+2.9	31.7	30.0	32.2	31.3	+2.0	35.3	33.4	35.9	34.9	+0.4	48.3	54.0	56.3	52.9	+1.7	1863-64
1864-65.	33.6	26.9	37.0	32.5	-1.9	29.0	22.0	27.9	26.3	-1.9	32.9	23.1	29.0	28.3	-1.0	35.1	27.8	32.7	31.9	-2.6	50.4	45.3	50.7	48.8	-2.4	1864-65
1865-66.	38.1	33.6	34.2	35.3	+0.9	32.4	26.3	27.6	28.8	+0.6	35.7	25.9	29.3	30.3	+1.0	37.7	31.3	35.0	34.7	+0.7	57.9	50.9	52.5	53.8	+2.6	1865-66
1866-67.	32.3	25.6	41.8	33.2	-1.2	27.1	20.6	34.7	27.5	-0.7	31.4	22.0	34.8	29.4	+0.1	33.3	24.4	39.0	32.2	-2.3	48.9	46.3	58.0	51.1	-0.1	1866-67
1867-68.	35.2	29.7	33.2	32.7	-1.7	28.4	21.3	23.7	24.5	-3.7	26.7	25.0	23.2	25.0	-4.3	31.8	29.3	27.2	29.4	-5.1	54.0	50.2	48.4	50.7	-0.5	1867-68
1868-69.	31.0	38.4	39.0	36.1	+1.7	25.9	32.8	30.4	29.7	+1.5	28.2	32.2	32.1	30.8	+1.5	31.0	38.1	38.4	35.8	+1.3	47.2	54.2	55.0	52.1	+0.9	1868-69
1869-70.	36.4	34.5	33.0	34.6	+0.2	32.0	29.1	26.2	29.1	+0.9	32.5	35.1	27.9	32.1	+2.8	37.1	39.3	34.6	37.0	+2.5	54.2	53.7	51.3	53.1	+1.9	1869-70
1870-71.	30.9	36.8	39.3	35.7	+1.3	29.8	30.2	30.2	30.1	+1.9	31.7	26.3	27.9	28.6	-0.7	34.0	32.6	35.9	34.2	-0.3	48.8	50.1	54.7	51.2	0.0	1870-71
1871-72.	32.6	30.5	33.6	32.2	-2.2	25.3	24.7	25.6	25.2	-3.0	30.1	26.4	27.8	28.1	-1.2	32.1	31.7	33.7	32.5	-2.0	48.6	45.2	48.2	47.3	-3.9	1871-72
1872-73.	29.1	30.8	35.5	31.8	-2.6	21.9	23.2	25.9	23.7	-4.5	23.8	27.0	26.3	25.7	-3.6	30.3	30.9	34.8	32.0	-2.5	45.1	47.4	53.3	48.6	-2.6	1872-73
1873-74.	40.4	37.7	37.7	38.6	+4.2	36.3	32.8	31.1	33.4	+5.2	33.0	32.3	27.9	31.1	+1.8	40.5	40.3	37.2	39.3	+4.8	50.7	49.6	50.8	50.4	-0.8	1873-74
1874-75.	40.7	26.5	27.1	31.4	-3.0	31.4	17.3	15.5	21.4	-6.8	31.2	21.6	21.8	24.9	-4.4	39.2	29.5	28.8	32.5	-2.0	52.2	46.8	49.1	49.4	-1.8	1874-75
1875-76.	43.6	42.1	39.7	41.8	+7.4	35.8	35.0	30.2	33.7	+5.5	30.5	31.4	28.9	30.3	+1.0	36.8	40.8	36.7	38.1	+3.6	53.4	55.4	54.2	54.3	+3.1	1875-76
1876-77.	25.2	30.9	41.0	32.4	-2.0	19.8	23.0	32.9	25.2	-3.0	23.9	24.9	32.5	27.1	-2.2	26.5	29.4	39.4	31.8	-2.7	43.4	50.7	50.5	48.2	-3.0	1876-77
1877-78.	47.4	36.0	40.9	41.4	+7.0	40.4	29.6	30.9	33.6	+5.4	36.6	29.6	31.2	32.5	+3.2	41.8	33.5	39.8	38.4	+3.9	53.5	49.7	51.6	51.6	+2.0	1877-78
1878-79.	31.2	30.4	33.6	31.7	-2.7	24.9	23.0	23.6	23.8	-4.4	30.4	24.8	25.5	26.9	-2.4	33.3	30.8	31.6	31.9	-2.6	48.6	49.6	49.3	49.2	-0.4	1878-79
1879-80.	41.2	48.6	42.6	44.1	+9.7	33.1	39.5	34.1	35.6	+7.4	35.4	36.8	32.9	35.0	+6.7	41.1	41.9	40.8	41.3	+6.8	57.9	58.3	56.4	57.5	+6.3	1879-80
1880-81.	30.6	30.1	36.2	32.3	-2.1	22.9	20.5	25.3	22.9	-5.3	27.5	23.4	28.2	26.4	-2.9	29.0	27.6	32.8	29.8	-4.7	48.6	46.8	51.9	49.1	-2.1	1880-81
1881-82.	43.6	37.5	46.5	42.5	+8.1	37.7	28.3	37.0	34.3	+6.1	38.3	28.0	31.3	32.5	+3.2	41.7	33.2	40.4	38.4	+3.9	55.5	55.1	57.3	56.0	+4.8	1881-82
1882-83.	34.9	30.9	38.3	34.7	+0.3	27.3	22.0	27.5	25.6	-2.6	30.0	25.6	28.7	28.1	-1.2	34.1	29.6	37.5	33.7	-0.8	48.5	51.4	57.0	52.3	+1.1	1882-83
1883-84.	39.0	26.7	41.2	35.6	+1.2	32.2	19.3	29.6	27.0	-1.2	22.0	26.1	33.1	27.1	-2.2	36.9	29.4	40.9	35.7	+1.2	56.0	46.6	58.7	53.8	+2.6	1883-84
1884-85.	36.1	26.1	23.2	28.5	-5.9	30.0	20.9	16.4	25.8	-2.4	33.4	27.5	20.4	27.1	-2.2	36.0	32.9	26.9	31.9	-2.6	53.7	50.7	47.5	50.6	-0.6	1884-85
1885-86.	35.0	25.4	30.1	30.2	-4.2	31.5	23.1	25.4	26.7	-1.5	32.9	27.2	26.7	28.9	-0.4	37.5	28.9	32.1	32.8	-1.7	50.4	42.8	47.6	46.9	-4.3	1885-86
1886-87.	28.7	29.6	39.3	32.5	-1.9	25.3	24.9	31.6	27.3	-0.9	29.9	26.7	29.4	28.7	-0.6	30.7	32.9	38.9	34.2	-0.3	48.4	45.6	56.7	50.2	-1.0	1886-87
1887-88.	34.7	29.3	34.9	33.0	-1.4	31.6	22.3	27.8	27.2	-1.0	32.2	19.7	27.9	26.6	-2.7	37.2	29.2	35.7	34.0	-0.5	51.0	51.0	54.0	52.0	+0.8	1887-88
1888-89.	37.0	37.2	30.3	34.8	+0.4	33.8	32.6	23.2	29.9	+1.7	34.4	33.7	25.2	31.1	+1.8	37.5	39.2	31.1	35.9	+1.4	49.2	51.6	47.4	49.4	-1.8	1888-89
1889-90.	42.2	41.5	43.1	44.3	+9.9	42.0	37.0	36.3	38.4	+10.2	37.7	34.6	33.5	35.3	+6.0	45.6	43.8	43.4	44.3	+9.8	60.0	59.3	60.6	60.0	+8.8	1889-90
1890-91.	35.8	36.2	40.0	37.3	+2.9	30.0	31.3	34.2	31.8	+3.6	27.2	30.8	32.6	30.2	+0.9	34.2	37.4	41.4	37.7	+3.2	51.4	50.5	58.4	53.4	+2.2	1890-91
1891-92.	42.0	26.0	38.8	35.6	+1.2	39.0	23.3	31.6	31.4	+3.2	38.8	29.6	29.4	32.6	+3.3	43.2	31.6	37.0	37.3	+3.8	55.2	47.8	53.0	52.0	+0.8	1891-92
1892-93.	31.6	21.2	34.0	28.9	-5.5	28.6	17.6	26.3	24.2	-4.0	28.5	20.4	26.6	25.2	-4.1	33.2	24.6	35.1	31.0	-3.5	52.3	43.4	55.7	50.5	-0.7	1892-93
1893-94.	36.4	37.7	32.9	35.7	+1.3	30.9	32.5	26.2	29.9	+1.7	31.5	30.1	25.8	29.1	-0.2	38.3	37.8	35.2	37.1	+2.6	53.6	52.8	52.8	53.1	+1.9	1893-94
1894-95.	37.5	26.6	23.8	29.3	-5.1	34.2	22.4	19.8	25.5	-2.7	32.0	28.2	33.8	28.0	-1.3	37.4	31.6	26.2	31.7	-2.8	52.4	49.0	41.1	47.5	-3.7	1894-95
1895-96.	37.3	33.6	35.0	35.3	+0.9	33.2	27.6	27.7	29.5	+1.3	35.2	25.5	28.8	29.8	+0.5	38.8	33.3	36.7	36.3	+1.8	50.9	48.2	52.4	50.5	-0.7	1895-96
1896-97.	38.1	29.0	36.4	34.5	+0.1	32.6	24.0	29.6	28.7	+0.5	29.1	27.4	30.0	28.8	-0.5	35.6	31.0	36.6	34.4	-0.1	49.5	47.4	55.0	50.6	-0.6	1896-97
1897-98.	36.3	37.2	34.9	36.1	+1.7	31.6	31.6	28.3	30.5	+2.3	35.1	30.3	33.0	32.8	+3.5	38.1	36.6	35.0	36.6	+2.1	54.0	54.9	50.1	53.0	+1.8	1897-98
1898-99.	32.2	32.3	24.6	29.7	-4.7	28.9	26.4	21.2	25.5	-2.7	31.8	29.8	25.1	28.9	-0.4	35.6	34.3	27.4	32.1	-2.1	51.2	49.9	49.2	50.1	-1.1	1898-99
1899-00.	33.2	35.4	29.9	32.8	-1.6	30.8	30.1	23.8	28.2	-0.0	35.8	32.6	30.8	33.1	+3.8	36.2	35.2	33.7	35.0	+0.5	51.3	49.9	49.1	50.1	-1.1	1899-00
1900-01.	35.4	33.2	27.2	31.9	-2.5	31.8	28.3	19.5	26.5	-1.7	33.5	29.8	25.2	29.5	+0.6	36.5	34.4	29.8	33.6	-0.9	50.9	49.9	47.5	49.4	-1.8	1900-01
1901-02.	31.0	31.5	25.1	29.2	-5.2	28.2	26.2	21.0	25.1	-3.1	33.6	27.7	28.6	30.0	+0.4	34.8	31.8	29.8	32.1	-2.9	48.6	47.2	4			

the first period, while at the other stations the mean of the second 25-year period was but a few tenths degree above the 50-year average.

TABLE 3.—*Overlapping or simultaneous records.*

Year.	Fort Snelling, Minn.				Fort Ripley, Minn.				Difference.
	Dec.	Jan.	Feb.	Mean.	Dec.	Jan.	Feb.	Mean.	
1854-55.....	20.6	17.1	12.6	16.8	18.2	8.4	8.2	11.6	-5.2
1855-56.....	9.5	6.1	11.7	9.1	5.0	-1.5	9.0	4.2	-4.9
1856-57.....	8.8	-2.5	16.4	7.6	5.1	-6.5	11.2	3.3	-4.3
Mean.....				11.2				6.4	-4.8
Year.	Fort Snelling, Minn.				St. Paul, Minn.†				Difference.
	Dec.	Jan.	Feb.	Mean.	Dec.	Jan.	Feb.	Mean.	
1867-68.....	16.1	4.2	13.9	11.4	15.2	4.4	12.7	10.8	-0.6
1868-69.....	15.5	18.2	19.4	17.7	16.3	19.0	18.7	18.0	+0.3
1869-70.....	19.5	12.6	17.0	16.4	20.4	12.2	17.1	16.6	+0.2
1870-71.....	19.6	13.1	20.2	17.6	19.4	13.4	20.7	17.8	+0.2
1871-72.....	7.7	18.8	18.4	13.3	8.8	14.2	19.6	14.2	+0.9
1872-73.....	3.9	4.4	11.0	6.4	5.8	6.0	13.3	8.4	+2.0
Mean.....				13.8				14.3	+0.5
Year.	Fort Snelling, Minn.				St. Paul, Minn.†				Difference.
	Dec.	Jan.	Feb.	Mean.	Dec.	Jan.	Feb.	Mean.	
1882-83.....	11.6	-2.8	8.9	5.9	16.0	1.1	12.1	9.7	+3.5
1883-84.....	15.8	3.7	8.0	9.2	19.8	7.9	13.3	13.7	+4.5
1884-85.....	8.9	-0.8	4.6	4.2	14.8	4.6	9.9	9.8	+5.6
1885-86.....	21.3	3.5	14.5	13.1	21.1	4.1	15.0	13.4	+0.3
1886-87.....	7.3	-1.1	8.4	4.9	8.4	1.0	9.7	6.4	+1.5
1887-88.....	16.1	-2.3	10.5	8.1	17.1	-0.9	13.4	9.5	+1.4
1888-89.....	25.4	18.3	5.9	16.5	24.8	20.2	10.2	18.4	+1.9
1889-90.....	29.1	10.9	19.9	20.0	28.6	9.9	18.5	19.0	-1.0
1890-91.....	21.7	19.6	8.7	16.7	24.0	21.2	11.2	18.8	+2.1
1891-92.....	29.4	10.8	23.0	21.1	27.3	10.0	20.8	19.4	-1.7
Mean.....				12.0				13.8	+1.8
Year.	Fort Leavenworth, Kans.				Leavenworth, Kans.				Difference.
	Dec.	Jan.	Feb.	Mean.	Dec.	Jan.	Feb.	Mean.	
1866-67.....	28.1	21.0	32.3	27.1	27.6	19.5	31.8	26.3	-0.8
1867-68.....	34.6	19.6	32.2	28.8	33.3	17.9	30.0	27.1	-1.7
1868-69.....	26.4	33.8	32.9	31.0	22.6	29.7	30.3	27.5	-3.5
1869-70.....	26.4	29.1	35.1	30.2	28.2	25.6	32.1	28.6	-1.6
1870-71.....	28.6	30.4	38.1	32.4	28.0	27.5	33.5	29.7	-2.7
Mean.....				29.9				27.8	-2.1
Year.	Leavenworth, Kans.				Kansas City, Mo.				Difference.
	Dec.	Jan.	Feb.	Mean.	Dec.	Jan.	Feb.	Mean.	
1888-89.....	35.8	29.8	27.5	31.0	35.9	31.2	28.5	31.9	+0.9
1889-90.....	45.3	28.1	32.3	35.2	46.4	30.2	34.0	36.9	+1.7
1890-91.....	37.0	33.2	29.8	33.3	37.4	34.0	30.2	33.9	+0.6
1891-92.....	39.3	23.9	36.4	33.2	39.6	25.6	36.8	34.0	+0.8
1892-93.....	26.0	21.8	26.6	24.8	27.2	22.0	26.9	25.4	+0.6
Mean.....				31.5				32.4	+0.9
Year.	Washington, D. C.				Georgetown, D. C.				Difference.
	Dec.	Jan.	Feb.	Mean.	Dec.	Jan.	Feb.	Mean.	
1870-71.....	34.0	32.6	35.9	34.2	34.3	31.7	36.7	34.2	0.0
1871-72.....	32.1	31.7	33.7	32.5	30.1	30.4	32.1	30.9	-1.6
1872-73.....	30.3	30.9	34.8	32.0	27.8	29.2	32.1	29.7	-2.3
1873-74.....	40.5	40.3	37.2	39.3	38.0	37.3	35.6	37.0	-2.3
1874-75.....	39.2	29.5	28.8	32.5	36.0	27.1	27.2	30.1	-2.4
Mean.....				34.1				32.4	-1.7
Year.	Cincinnati, Ohio (not W. B.).				Cincinnati, Ohio (W. B.).				Difference.
	Dec.	Jan.	Feb.	Mean.	Dec.	Jan.	Feb.	Mean.	
1870-71.....	30.8	34.5	36.6	34.0	30.9	36.8	39.3	35.7	+1.7
1871-72.....	29.7	28.2	32.3	30.1	32.6	30.5	33.6	32.2	+2.1
1872-73.....	25.4	27.1	31.3	27.9	29.1	30.8	35.5	31.8	+3.9
Mean.....				30.7				33.2	+2.5

† Values for series 1867-1873, inclusive, from voluntary records; for series 1882-1892 from Weather Bureau records.

In this connection it should be borne in mind that the data prior to the establishment of the Weather Bureau stations were obtained from instruments believed to have been exposed in shelters over sod, and in the open, and which, during the winter time, would give lower temperatures than instruments having exposures such as obtain at Weather Bureau stations. This fact would modify, if not reverse, the slight apparent higher average temperature during the second 25-year period at the majority of stations; and this statement is, I think, fully

borne out, especially if the mixed data for Forts Snelling and Leavenworth are omitted, by comparing the data given in Table 2 for the two 25-year periods with each other, and with the winter of 1903-4, which shows that the winter of 1903-4 at Cleveland, Ohio, was by 0.4° the coldest, and at New Bedford 1.3° the coldest, in fifty years. Washington, D. C., had one winter colder and one with the same mean, both in the first twenty-five years; at Charleston one was colder in each period; Chicago and Cincinnati, each, one colder, in the first period; St. Louis, three colder in the first and five colder in the second period; New Orleans, eight winters colder in the first period (17 years) and nine colder in the second; Fort Leavenworth, fourteen colder in the first period and eleven colder in the second; and Fort Snelling, six colder in the first and five colder in the second period.

By reference to the article "The winter of 1903-4," page 125 of the MONTHLY WEATHER REVIEW for March, 1904, it will be found that the last winter was unusually cold over the portion of the United States covered by the accompanying data only.

TABLE 4.—*Thermometer exposure.*

Station and date of establishment.	Kind of shelter.	Height above ground.	Date changed.	Intervals.	
				Years.	Months.
St. Paul, Minn., Nov. 1, 1870.....	Window.....	Feet. 32	Apr. 16, 1883	12	6
Do.....	Window.....	44	Sept. 1, 1885	2	4
Do.....	Roof.....	114	Nov. 1, 1903	8	2
Do.....	Roof.....	102	Present.....	0	7
Leavenworth, Kans., May 26, 1871.....	Window.....	34	Jan. 1, 1892	20	8
Do.....	Roof.....	95	Nov. 10, 1893	1	10
Kansas City, Mo., July 1, 1888.....	Roof.....	86	May 1, 1890	1	10
Do.....	Roof.....	78	Present.....	14	1
New Orleans, La., Oct. 24, 1870.....	Window.....	7	Nov. 18, 1871	1	1
Do.....	Window.....	29	Mar. 3, 1880	8	3
Do.....	Window.....	45	Aug. 1, 1885	5	4
Do.....	Roof.....	87	July 19, 1890	5	0
Do.....	Roof.....	112	Oct. 31, 1900	10	3
Do.....	Roof.....	88	Present.....	3	8
St. Louis, Mo., Oct. 12, 1870.....	Window.....	70	July 15, 1871	0	9
Do.....	Window.....	72	Mar. 3, 1873	1	9
Do.....	Window.....	84	Apr. 1, 1879	6	1
Do.....	Roof.....	105	Sept. 15, 1883	4	5
Do.....	Roof.....	70	Sept. 1, 1887	4	0
Do.....	Dome.....	107	Oct. 1, 1892	5	1
Do.....	Dome.....	110	Aug. 16, 1903	10	10
Do.....	Roof.....	208	Present.....	0	10
Chicago, Ill., Oct. 14, 1871.....	Window.....	42	June 14, 1872	0	8
Do.....	Window.....	74	June 8, 1873	1	0
Do.....	Window.....	70	Dec. 31, 1886	13	6
Do.....	Roof.....	144	Feb. 1, 1890	3	1
Do.....	Roof.....	241	Present.....	14	5
Cincinnati, Ohio, Oct. 12, 1870.....	Window.....	68	Jan. 1, 1885	14	5
Do.....	Roof.....	84	Mar. 1, 1885	0	2
Do.....	Roof.....	153	Aug. 16, 1898	13	6
Do.....	Roof.....	152	Present.....	5	10
Cleveland, Ohio, Oct. 17, 1870.....	Window.....	30	Apr. 30, 1873	2	3
Do.....	Roof.....	45	July 26, 1879	6	3
Do.....	Roof.....	73	Nov. 14, 1884	5	3
Do.....	Roof.....	82	July 1, 1888	3	7
Do.....	Roof.....	69	Oct. 14, 1889	1	4
Do.....	Roof.....	118	Jan. 1, 1891	1	2
Do.....	Roof.....	97	May 1, 1892	1	5
Do.....	Roof.....	122	Oct. 1, 1896	4	6
Do.....	Roof.....	190	Present.....	7	9
Washington, D. C., Nov. 1, 1870.....	Window.....	44	Aug. 15, 1888	17	8
Do.....	Roof.....	58	Mar. 29, 1889	0	8
Do.....	Roof.....	59	Present.....	15	3
Charleston, S. C., Jan. 1, 1871.....	Window.....	41	Jan. 1, 1886	15	0
Do.....	Roof.....	60	Feb. 1, 1897	11	1
Do.....	Sod.....	14	Present.....	7	5

### THE CROW CREEK FLOOD OF MAY 20, 1904, AT CHEYENNE, WYO.

By W. S. PALMER, Section Director, Cheyenne, Wyo.

The most disastrous flood in the history of Cheyenne occurred on the night of May 20, 1904, when, as a consequence of heavy rains or cloudbursts over its upper drainage area, Crow Creek became a raging torrent, overflowing its banks, flooding the adjacent lowlands, and carrying away bridges and houses. The flood was unusual, as Crow Creek is normally but a small stream, and during much of the summer and fall its flow is so much reduced that a person can readily step across its bed.

Crow Creek rises in the mountains west of Cheyenne, and is formed by the junction of three streams, South Crow, Middle